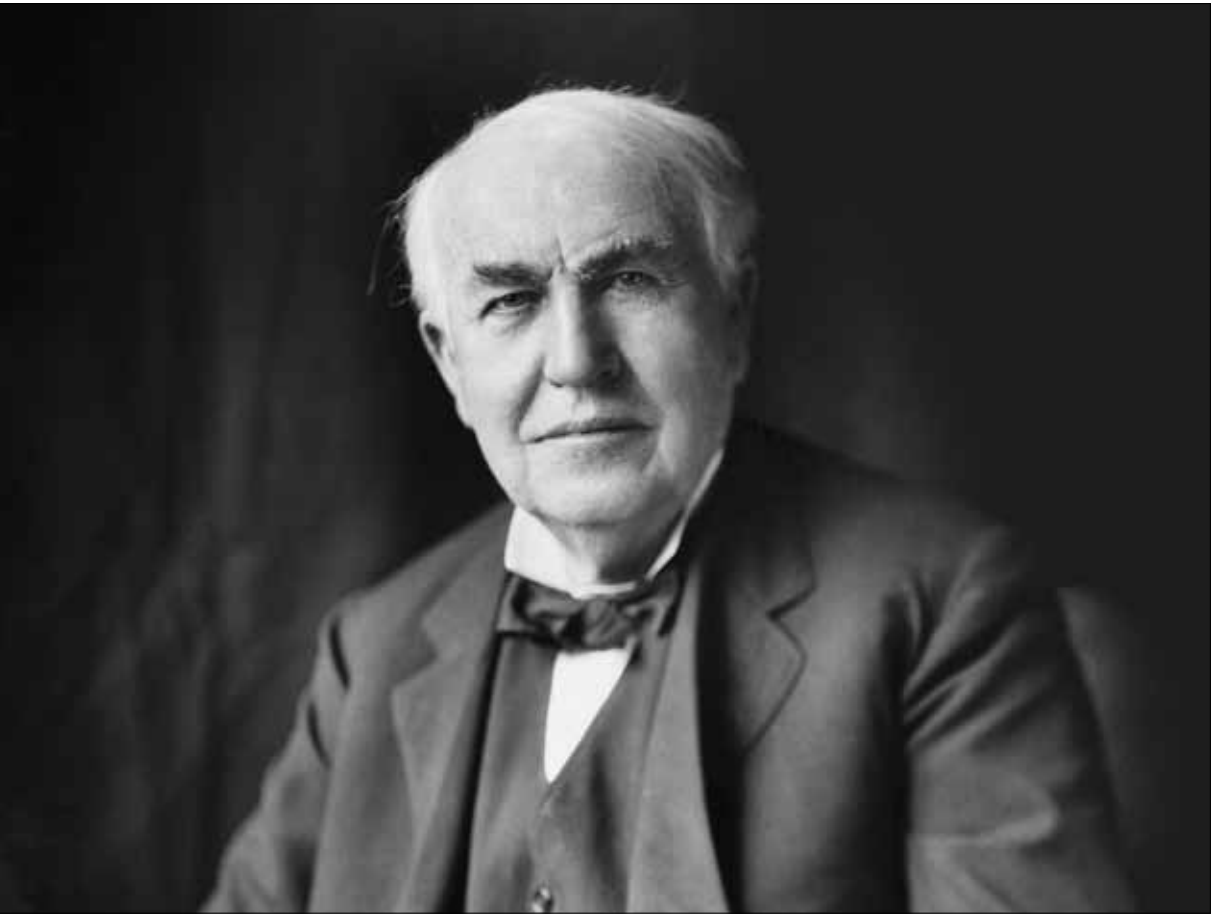


DC set to return with a vengeance

Ever since the late 19th century, when alternating current (AC) toppled direct current (DC) to become king of the world's power distribution systems, AC has reigned supreme. But that may be about to change. ABB plans to put DC back on the throne, but this time alongside AC. It will not be a smooth ride, and it can not do it alone, but the planet will reap the rewards.



Dubbed “The War of the Currents,” the battle that raged between the DC advocate Thomas Edison and the AC proponent George Westinghouse in the late 1880s sometimes took a nasty turn. Edison spread disinformation about fatal AC accidents, publicly killed animals with AC and even went so far as to secretly pay someone to invent the electric chair – all to promote the idea that AC was deadlier than DC.

Now things are about to come full circle. AC and DC may be about to enter into a “power-sharing” agreement, with the help of ABB. But unlike Edison, the company will not be using smear tactics to get its message across. It has good news for anyone concerned about our planet: that its Onboard DC Grid is more fuel-efficient, decreases emissions, reduces electrical footprint and enables the use of alternative energy sources.

What more could the industry, and indeed the world, ask for? Things are not quite that simple, though. The idea of a DC power distribution system is such a radical departure from the conventional AC standard that it will require a mindset change for a host of industry players.

And, as with any new technology, there are those willing to take the necessary risks and then there are the skeptics shaking their heads on the sidelines. Back in 1893, it took a lot of convincing for the Niagara Falls Power Company to finally award the contract for the world’s first AC hydroelectric plant to Westinghouse and to reject General Electric and Edison’s DC proposal. Some doubted that the system would generate enough electricity to power industry in Buffalo.

Title picture

George Westinghouse (left) and Thomas Edison (right)

Today, there is a similar mix of feelings about the DC Grid. Engineers, classification societies, owners, shipbuilders and suppliers may be fired with the spirit of innovation or cautious about what this paradigm shift will mean.

Norwegian owner Myklebusthaug is putting its money on the innovative idea. In November last year the company agreed to equip a newbuild platform support vessel (PSV) being built at Kleven shipyard in Ulsteinvik, Norway, with the DC Grid. ABB thus secured its first pioneering order.

Other owners are not steaming ahead quite so fast. However, Bernd Friedrich of MAN Diesel & Turbo, a market leader for large diesel engines, says that while owners may need convincing, once they understand the fuel-saving potential, they buy it.

Until now we knew there was a potential for this but we were not able to utilize it.

MAN Diesel & Turbo is putting its engine know-how together with ABB's expertise in electrical equipment to develop the DC Grid.

Friedrich, who is head of engineering for diesel-electric drives, says the DC Grid is what his company "has been waiting for."

"Until now we knew there was a potential for this but we were not able to utilize it. The idea, of course, was available but nobody did it. The system to handle it has not been available up to now. Since ABB has put money into developing a new standard, we can do it." A big obstacle in convincing owners of the benefits of DC is its old-fashioned image, says Friedrich.

"They are not really used to it because it sounds like technology that was around 20 years ago, so we have to do a lot of explaining in the market."

Another player that needs to be won over is the yard. "In the DC system, you have smaller components and it is spread in smaller pieces. The yard has more

flexibility in arranging these things. They want to know where they can place them, how heavy they are, and how the price of the equipment compares to conventional equipment.

"Handling a DC system is not just laying cable, it depends on whether the yard is skilled enough to install it. I foresee some troubles with inexperienced yards."

Like MAN Diesel & Turbo, Norwegian classification society Det Norske Veritas (DNV) has long seen the potential for using DC and had been researching the idea before ABB came up with their proposal.

"It has been on the agenda but we have not made specific proposals that will work in practice," says Arnstein Eknes, segment director for special ships at DNV.

Eknes says DNV's initial response to innovations such as the DC Grid is always "This is interesting and challenging and will give opportunities for new solutions."

"Most important in this phase is to seek partners who are keen to see opportunities and capable of foreseeing the bottlenecks we may have to remove or what obstacles we need to overcome in order for it to succeed."

One of these obstacles is the need to meet the safety demands of current rules and regulations as set by the classification society. ABB has worked closely with DNV to ensure its DC Grid does this. (Read more about how DNV develops new class rules on page 35).

But before ABB could think about the rules, it had to ignore them, says lead engineer on the DC Grid project Kläus Vänskä. "The old rules set limitations by describing conventional solutions. When we first looked into this, we thought, okay, we should forget about the rules, they should not hurt our thinking. We are not going against the rules, though, because we are still following what is behind them," says Vanska.

He seems slightly in awe of what he and the rest of the team at ABB have created and he admits that even they do not understand its full ramifications.

"With the DC Grid, we can optimize the combustion process so you have much cleaner air going through the system. It is hard to imagine all the benefits right now.

“We have been optimizing the electrical parts and each player can optimize their own components. We do not have knowledge about every component because we have not been looking so much outside of our own borders but now we are opening it up fully to other players.

“We are building up the foundation for much wider development. Engine makers will be able to pay more attention to emission reduction. I want to see what they can do.”

Meanwhile, the team is carrying out diesel laboratory tests in Finland and the Netherlands, says Jostein Bogen, DC Grid project owner, who came to the project in August 2010. “We are targeting the first installation to be done mid-2013,” he adds.

Bogen is full of praise for his team, which he says is great to work with. “I have never worked with such an enthusiastic and innovative team. They are bubbling over with new ideas all the time.”

As with any innovation, two brains are better than one. In fact, the more brains the better. Eknes certainly agrees. “If you want to go fast, go alone. But if you want to reach far, go together. So if the intention is to be a step ahead for the rest of the world, the rest of the technology providers out there... then it makes sense to involve them in the sharing process.”

Roald Myklebusthaug of Myklebusthaug Management, the first owner to use the DC Grid on board one of its vessels, says he does not feel as if his company is taking a risk.

“We saw that only a few things are new. Most of the equipment is well-known with proven performance. We do not see it as a problem that a new control system and new software is needed.” Myklebusthaug is referring to the fact that while the new control system is DC driven, the AC-based components can still be plugged in.

“ABB is a strong company and we expect them to provide us with the best of the best. We count on their backing both before and after delivery of the vessel.” Myklebusthaug adds that the company’s reasons for fitting its next vessel with DC Grid are “purely economical”. “With performance on a par with conventional diesel-electric propulsion systems, the most fuel-efficient vessel will always be the most attractive in the market.”

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By establishing a full-scale test setup “and doing a very good job of testing everything,” Myklebusthaug says his company trusts that ABB is able to eliminate any problems before the onboard installation. “Without this confidence we would never have done this,” he adds.

Perhaps a dose of friendly cooperation and trust would have served Edison better back in the 1800s. It may have prevented the AC/DC split, which looks set to come to an end on board the world’s ships.



Arnstein Eknes, segment director for special ships at DNV

Rules do not block innovation

Bringing people together to share information is what the Norwegian classification society Det Norske Veritas (DNV) does every day. If a new idea like ABB's Onboard DC Grid means the rules need a rethink, then DNV is ready for the communication challenge.

As a rule-maker, how does the classification society deal with groundbreaking ideas in the shipping industry that requires its rules to be changed?

The answer can be summed up in three words: communication, interaction and consensus.

As Arnstein Eknes, segment director for special ships at DNV, explains, "You need several parties involved to get the ball rolling. For a new standard to become relevant in the market, a lot of players need to participate."

"Rules exist for a reason. This is like a pyramid. At the top level, there is always a purpose or goal/objective, and at the bottom you should find the prescriptive and detailed rules that represent 'best practice.' When we have experience with technology, and learned what makes sense to ensure a design is safe, it is cost efficient to have rules codifying that experience. In the middle of the pyramid you find the functional requirements and their set of goals."

Between getting an idea for a new standard accepted and making new rules, there is a vital step: cross-disciplinary discussions.

"For a power distribution system like the Onboard DC Grid, we would like to see involvement from players such as equipment makers and designers, who need to understand how to integrate this into a ship's hull,

Getting rules changed is about bringing people together to share information and develop a new, improved consensus, says DNV's Arnstein Eknes. This his organization does every day.

for example. Multi-disciplinary groups should look at the new technology and how it will influence their own areas. The more discussions we can have to understand the different perspectives the better,” adds Eknes.

He underlines the need to have a combination of specialist knowledge and general or more holistic competence represented in the process. Technology expert assessments should be combined with an industry-wide perspective on costs and benefits.

“Almost continuously prospective innovators visit DNV, where they team up with anything from five to 20 specialists, who have an opportunity to ask the innovator open questions directly,” Eknes explains. “Normally we do not develop new rules just because we have a new technology. Most technologies we see can fit within the goals and purpose of the existing rules and standards.”

If you come up with a technology and can prove that it is equally safe or safer but does not fit into the rules, we can still accept it. Rules should not be a barrier for innovation.

“However, once it is clear that an attractive new solution can not be certified according to existing rules, the development of new rules is the logical next step. This involves taking the idea to a wider external network.”

For ABB, a key motivation in inviting DNV into a partnership for its Onboard DC Grid project was to start this process of formulating new classification rules and technology verification. The engineers on the project realized this would be necessary very early on.

“To initiate the formulation of new rules we create a proposal and activate a hearing process with different committees around the world,” says Eknes.

“We have a group called the rule secretariat that is responsible for ensuring we are formulistic in the way we test the market. We ask our customers questions, give them time to be heard, make time to understand and ask more questions. This is a dynamic process. It should be open and inviting the people who really want to contribute in this area.”

Eknes says hearing routines, both internal and external within the industry are important because they give the industry a chance to “criticize and improve our rules.” The time involved in the process varies depending on the concerns being raised. A new solution with great benefits and no added risk will obviously be completed quickly compared to one where a lot of issues need to be investigated.

Eknes explains that DNV as an independent foundation invests its own resources into research alongside industry partners, as well as public funders, to fulfill its purpose of safeguarding life, property and the environment: “At any time we have 30-50 active industry projects. Some of them with one single partner, but more often with five to 20 cooperating partners sharing knowledge and costs.”

Rather than telling the industry what it can and can not do, DNV seems to facilitate a dialogue that provides an industry-wide quality assurance for new ideas.

For a technology provider, this shortens the time-to-market in two ways, according to Eknes: “Since rules should represent both purpose, goals for efficient use of resources as well as ‘best practice’ based on lessons learned, they give a sound structure to the decision making during development. Secondly, when a new solution finally obtains its certification, even against new rules, it is proven ready for a worldwide market.”